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September 15, 2004

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APPLICATION NUMBER: 60/492,918

FILING DATE: August 06, 2003

RELATED PCT APPLICATION NUMBER: PCT/US04/25504

Certified by



Jon W Dudas

Acting Under Secretary of Commerce  
for Intellectual Property  
and Acting Director of the U.S.  
Patent and Trademark Office



16523 U.S. PTO  
06/06/03

Approved for use through 10/31/2002. OMB 0851-0032  
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## PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. EO 901 248 875 US

| INVENTOR(S)  |                        |   |           |   |                    |
|--|------------------------|---|-----------|---|--------------------|
| Given Name (first and middle [if any])   | Family Name or Surname | Residence<br>(City and either State or Foreign Country)                   |           |   |                    |
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| <input type="checkbox"/> Additional inventors are being named on the _____ separately numbered sheets attached hereto  |                        |   |           |   |                    |
| TITLE OF THE INVENTION (500 characters max)  |                        |   |           |   |                    |
| Switchable Hydrobushing With Post-Molding Formed Travel Restrictor Feature<br>In A Vibration-Reduction Mount With Interlock Feature                            |                        |   |           |   |                    |
| Direct all correspondence to: <b>CORRESPONDENCE ADDRESS</b>  |                        |   |           |   |                    |
| <input checked="" type="checkbox"/> Customer Number  |                        | 29293   |           | <input type="checkbox"/>  |                    |
| OR   |                        | Type Customer Number here   |           |   |                    |
| <input type="checkbox"/> Firm or Individual Name   |                        | Ronald W. Wangerow  |           |   |                    |
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| ENCLOSED APPLICATION PARTS (check all that apply)  |                        |   |           |   |                    |
| <input checked="" type="checkbox"/> Specification Number of Pages  |                        | 2   |           | <input type="checkbox"/> CD(s), Number <input type="text"/>   |                    |
| <input checked="" type="checkbox"/> Drawing(s) Number of Sheets  |                        | <input type="text"/>  |           | <input checked="" type="checkbox"/> Other (specify) Recordation Form Cover Sheet,<br>Assignment Document, return postcard |                    |
| <input type="checkbox"/> Application Data Sheet. See 37 CFR 1.76   |                        |   |           |   |                    |
| METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT   |                        |   |           |   |                    |
| <input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27.  |                        |   |           | FILING FEE<br>AMOUNT (\$)   |                    |
| <input type="checkbox"/> A check or money order is enclosed to cover the filing fees   |                        |   |           | \$160.00  |                    |
| <input type="checkbox"/> The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: <input type="text"/> |                        |   |           | + 40.00   |                    |
| <input checked="" type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.   |                        |   |           | \$200.00  |                    |
| The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.                        |                        |   |           |   |                    |
| <input checked="" type="checkbox"/> No.  |                        |   |           |   |                    |
| <input type="checkbox"/> Yes, the name of the U.S. Government agency and the Government contract number are: _____   |                        |   |           |   |                    |

Respectfully submitted

SIGNATURE

*Ronald W. Wangerow*

TYPED or PRINTED NAME

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(734) 354-5445

Date August 6, 2003

REGISTRATION NO.

(if appropriate)

Docket Number:

29,597

03-0025

### USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

This collection of information is required by 37 CFR 1.51. The information is used by the public to file (and by the PTO to process) a provisional application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the complete provisional application to the PTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, D.C. 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Box Provisional Application, Assistant Commissioner for Patents, Washington, D.C. 20231.

60/492918  
06/06/03

SWITCHABLE HYDROBUSHING WITH POST-MOLDING  
FORMED TRAVEL RESTRICTOR FEATURE IN A  
VIBRATION-REDUCTION MOUNT WITH INTERLOCK FEATURE

Brief Description of the Invention

The invention includes a switchable (through DC linear actuator activation) hydrobushing mount to create a fully switchable coupled/decoupled hydrobushing. The invention also provides a method of performing a post-molding forming operation on the bonded-to metal surface/structure to allow the use of a secondary operation peened fastener to provide triaxial travel restriction of a vibration reduction mount. Further, the method performs an in-molding reorientation of the metal surface/structures to generate a fully interlocked vibration reduction mount.

Advantages of the Invention

The invention provides the ability to have a fully switchable hydrobushing design, with superior low amplitude (decoupled) performance over a conventional hydrobushing. The design has significant engineering flexibility (rate ratios and packaging) over conventional hydromounts by using a realistic, manufacturable design concept that does not rely upon expensive vacuum switching hardware.

A method is provided which has the advantage of utilizing existing metal components to support triaxial travel restriction in a vibration reduction mount. Application requirements and ultimate fatigue life of the vibration reduction mount are directly tied to the overall ability of the mount design to limit allowable travel and to provide final metal-to-metal interlock features. By using a post-molding forming

operation to orient the support tabs of an existing metal, these goals can be accommodated without a secondary structural component, thus reducing part cost, complexity, and mass.

The method further provides a fully interlocked vibration reduction mount structure. Typical design and manufacturing processes require the use of secondary processes and/or additional components to provide fully interlocked construction. By utilizing a rotation interlocked feature in the part design, these same goals can be achieved with the elimination of either a secondary process or additional structural member. A significant advantage of the invention is that it allows the injection/expansion molding of a vibration reduction mount that is fully interlocked after the molding process.

Further detail and advantages of the invention can be more clearly appreciated through the accompanying drawing figures.

#### Brief Description of the Drawings

The numbered items in the drawings figures are described as follows:

1. Molded assembly
2. Travel restrictor pin

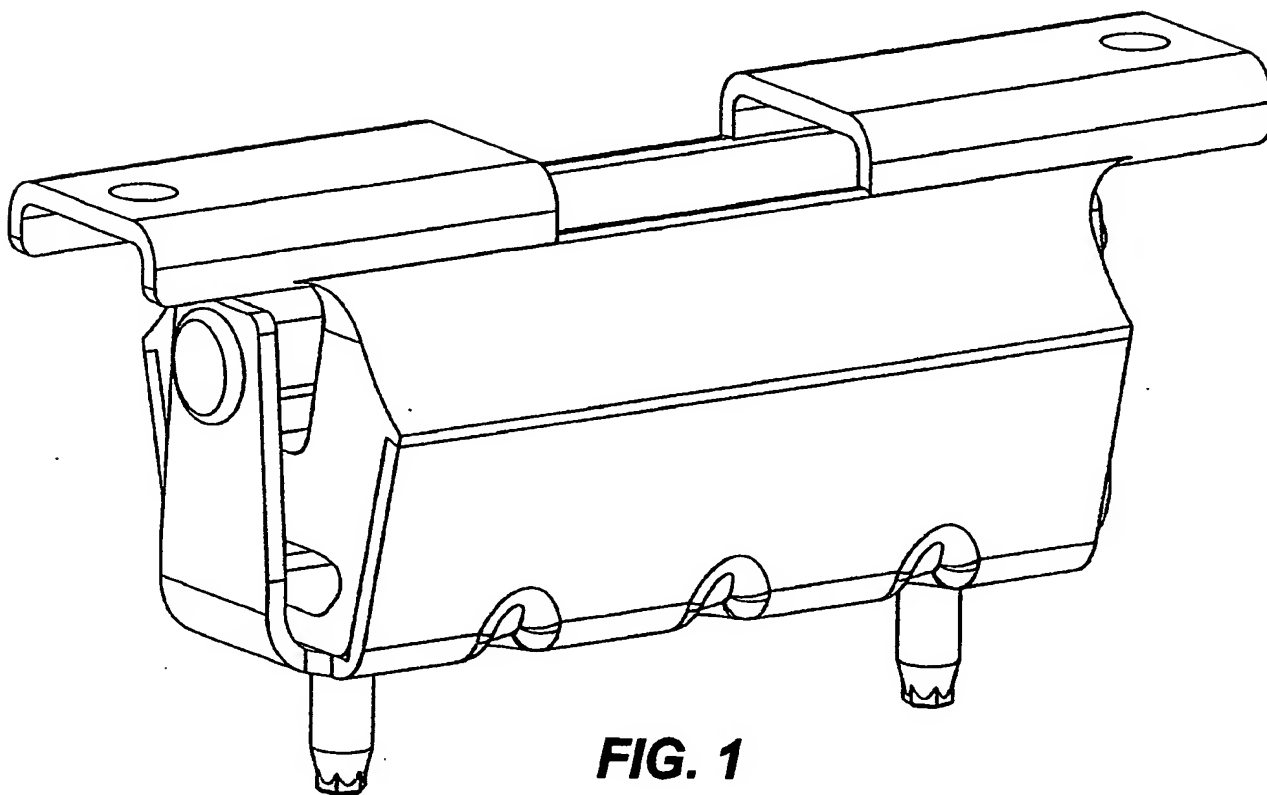
Title: SWITCHABLE HYDROBUSHING WITH POST-MOLDING FORMED TRAVEL RESTRICTOR  
FEATURE IN A VIBRATION-REDUCTION MOUNT WITH INTERLOCK FEATURE

Inventor(s): Wirges et al.

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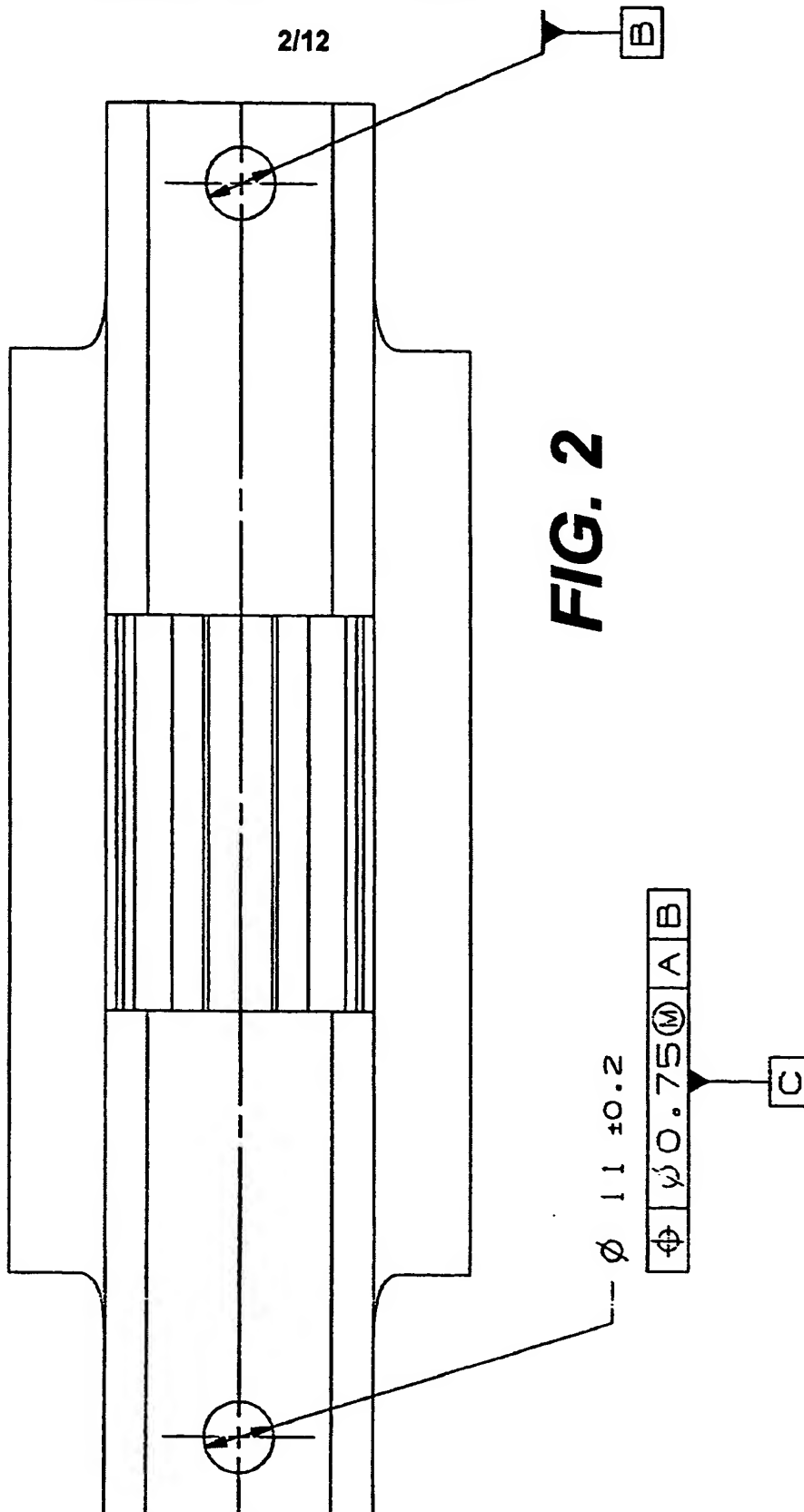
**FIG. 1**

Title: SWITCHABLE HYDROBUSHING WITH POST-MOLDING FORMED TRAVEL RESTRICTOR  
FEATURE IN A VIBRATION-REDUCTION MOUNT WITH INTERLOCK FEATURE

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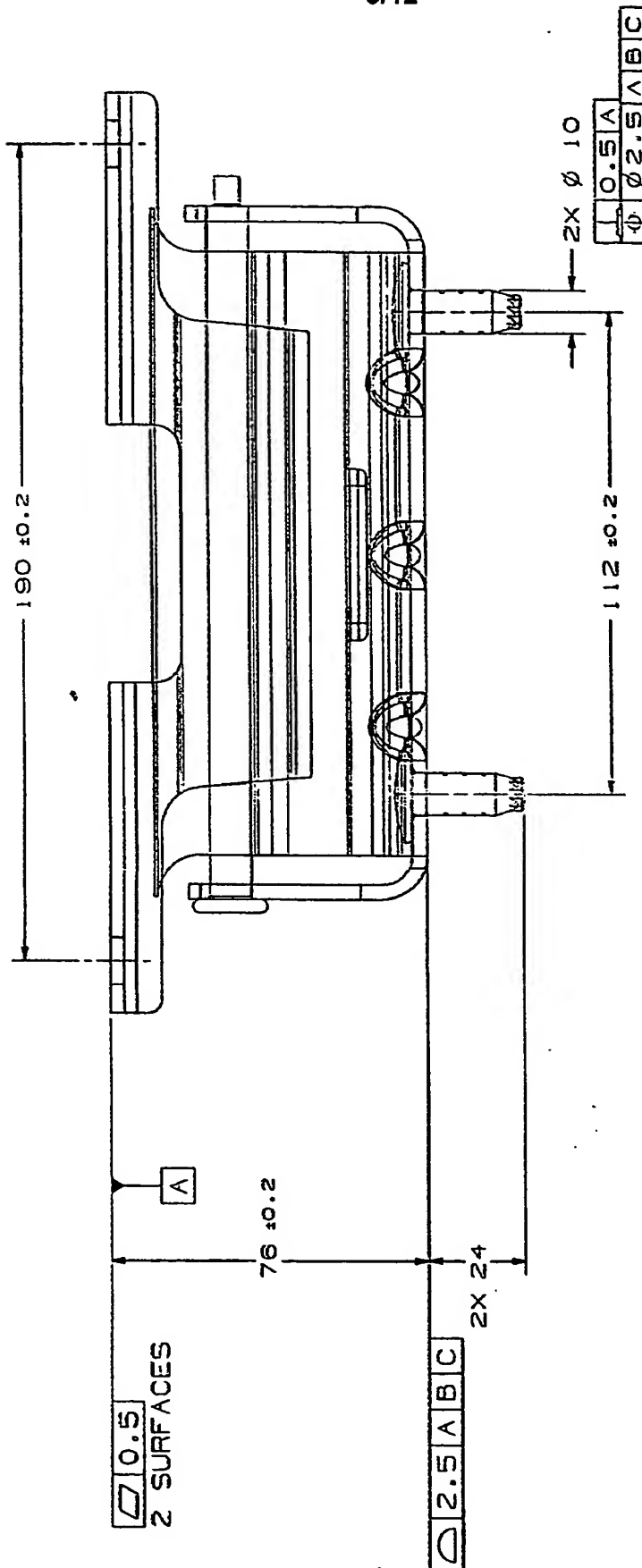


FIG. 3

**FIG. 4**

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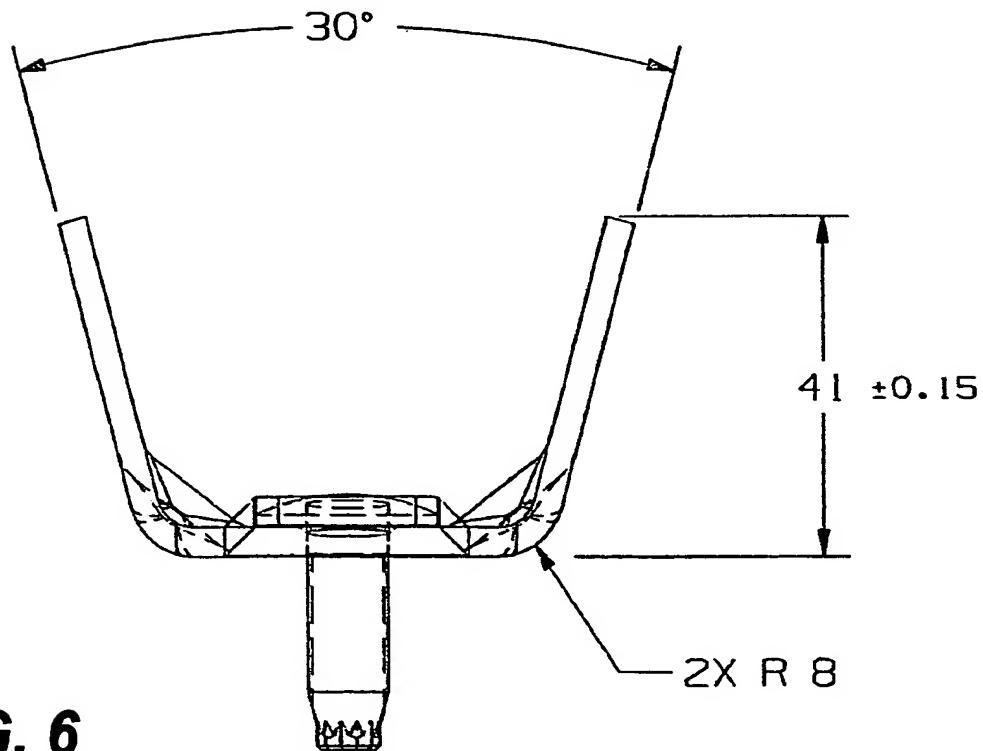
Title: SWITCHABLE HYDROBUSHING WITH POST-MOLDING FORMED TRAVEL RESTRICTOR  
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**FIG. 6**

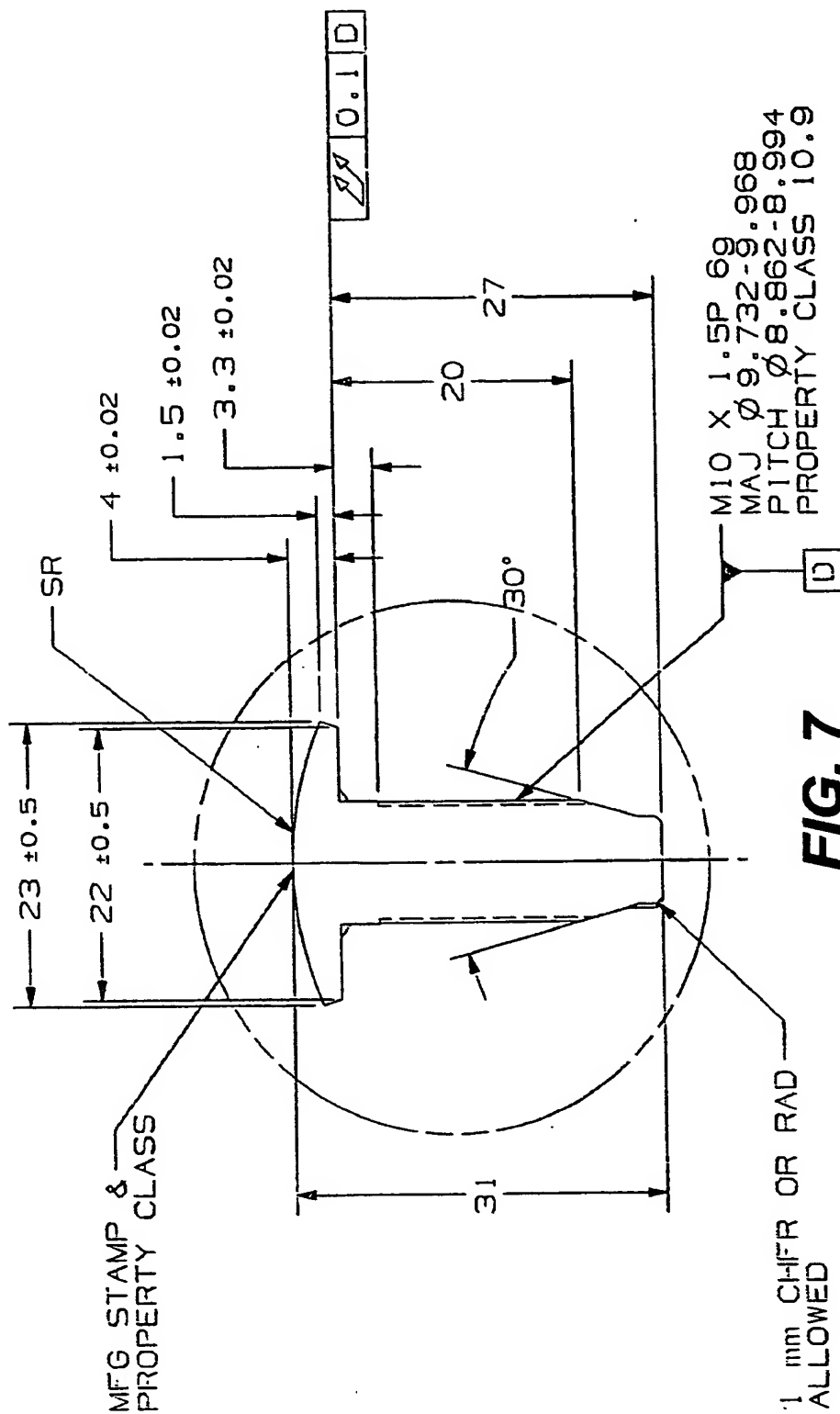
Title: SWITCHABLE HYDROBUSHING WITH POST-MOLDING FORMED TRAVEL RESTRICTOR  
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**FIG. 8**

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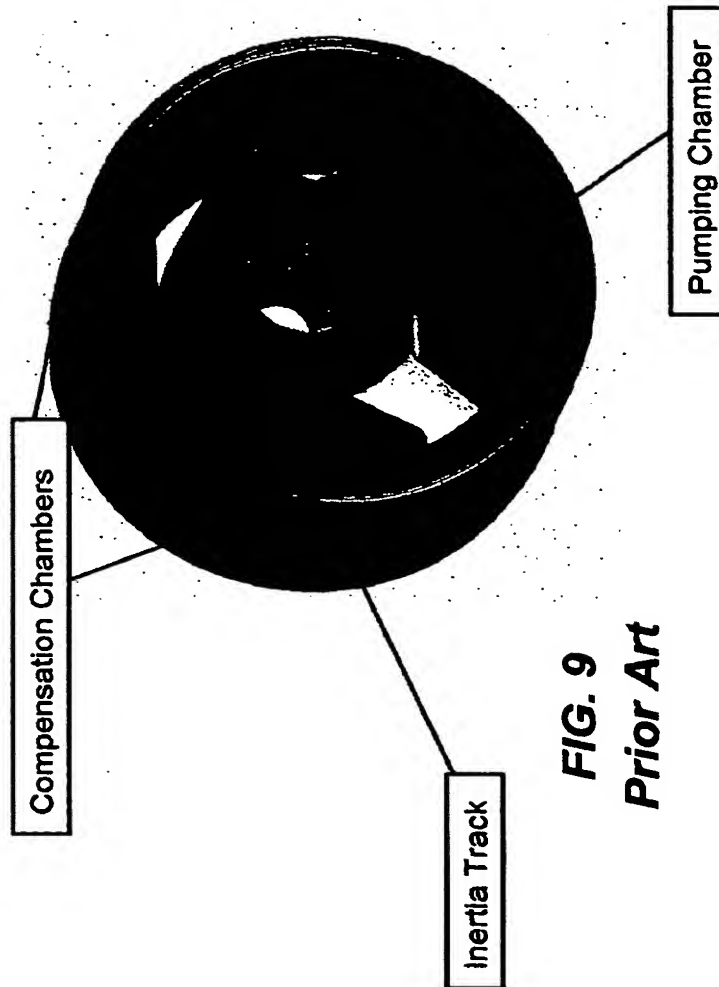
Title: SWITCHABLE HYDROBUSHING WITH POST-MOLDING FORMED TRAVEL RESTRICTOR  
FEATURE IN A VIBRATION-REDUCTION MOUNT WITH INTERLOCK FEATURE

Inventor(s): Wirges et al.

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**FIG. 9**  
**Prior Art**

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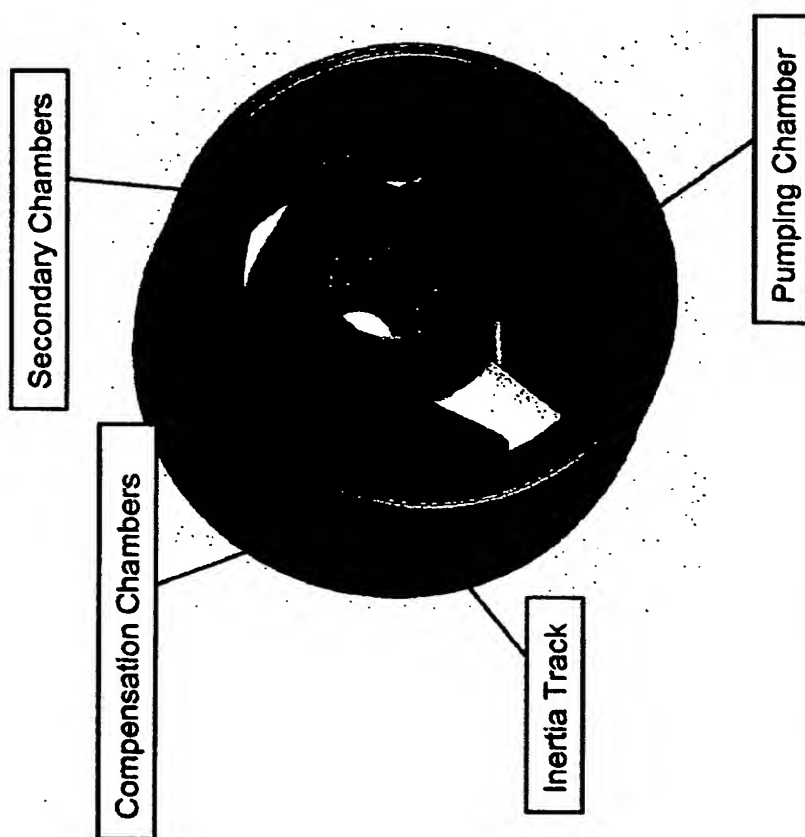
Title: SWITCHABLE HYDROBUSHING WITH POST-MOLDING FORMED TRAVEL RESTRICTOR  
FEATURE IN A VIBRATION-REDUCTION MOUNT WITH INTERLOCK FEATURE

Inventor(s): Wirges et al.

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**FIG. 10**

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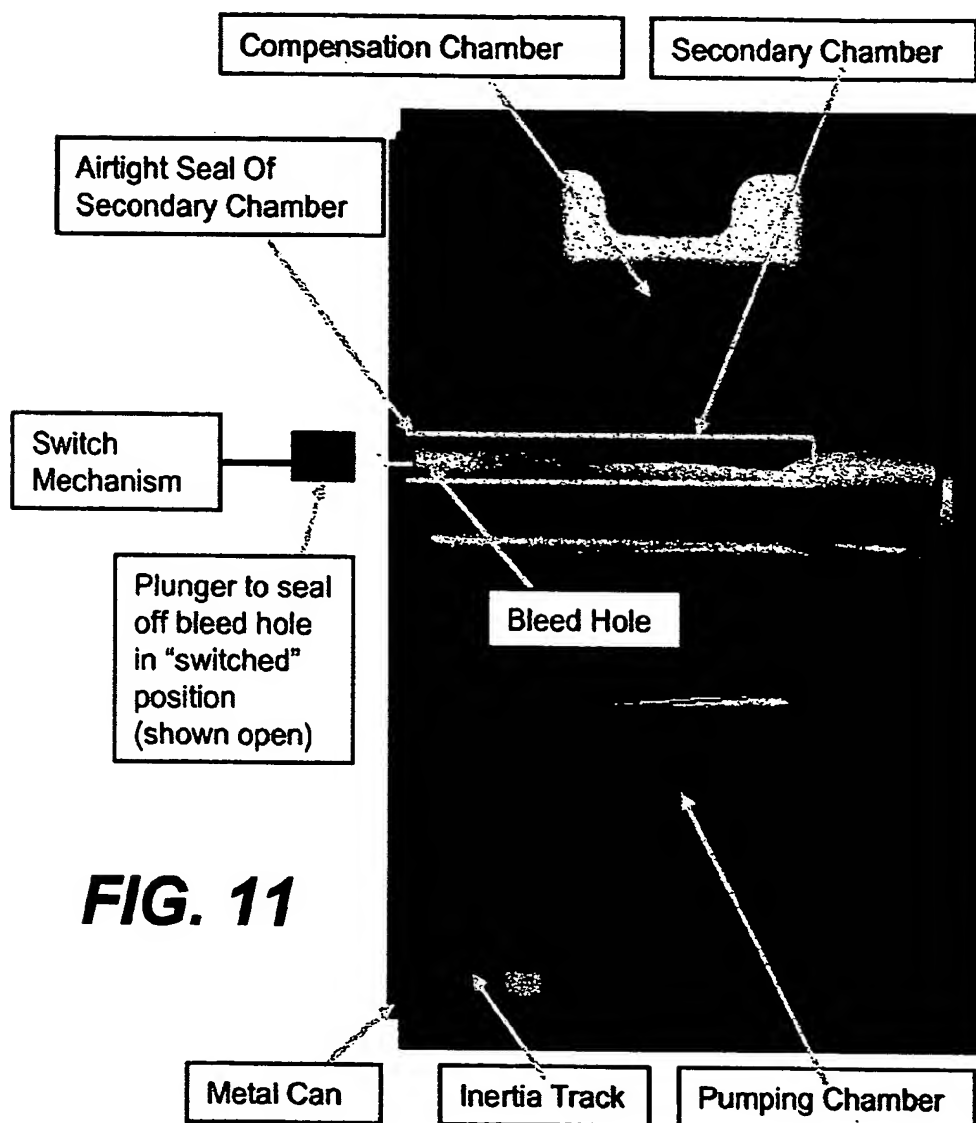
Title: SWITCHABLE HYDROBUSHING WITH POST-MOLDING FORMED TRAVEL RESTRICTOR  
FEATURE IN A VIBRATION-REDUCTION MOUNT WITH INTERLOCK FEATURE

Inventor(s): Wirges et al.

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**FIG. 11**

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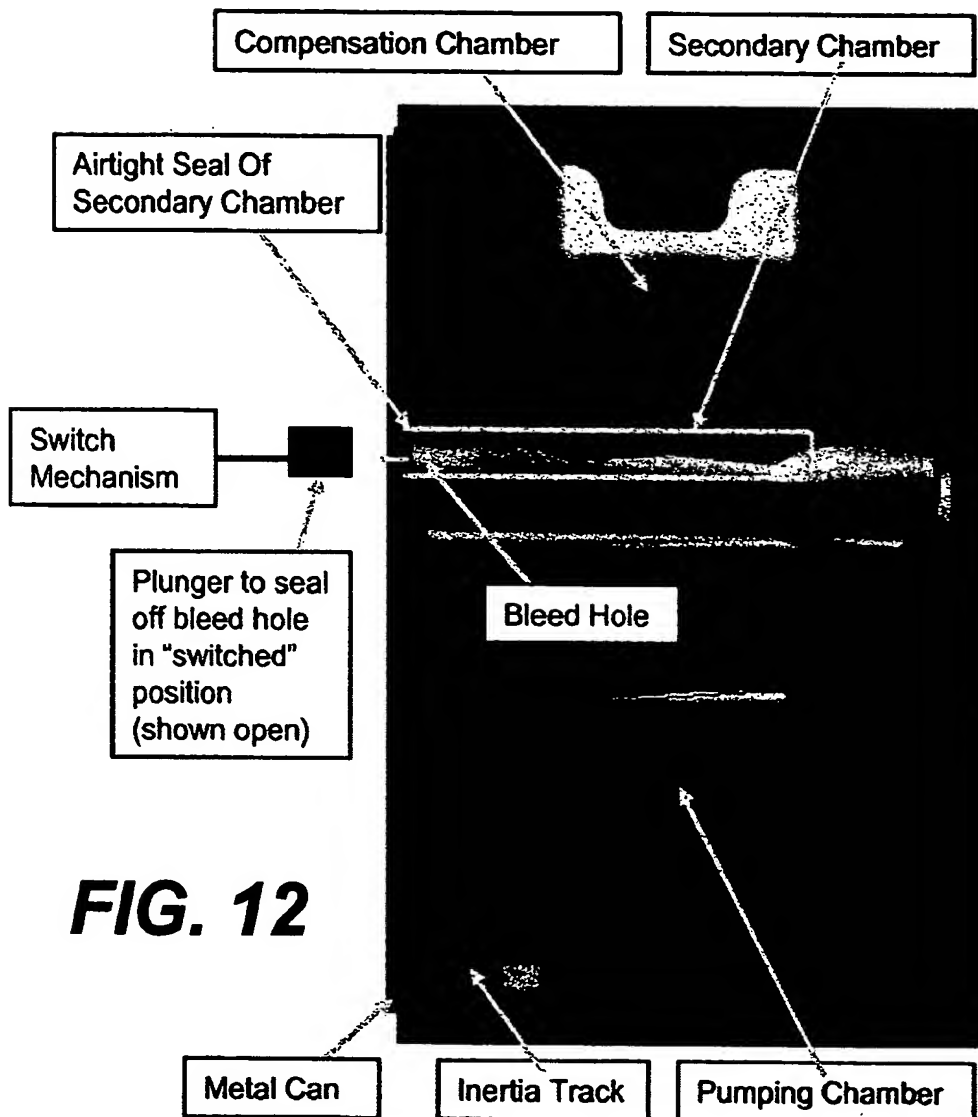
Title: SWITCHABLE HYDROBUSHING WITH POST-MOLDING FORMED TRAVEL RESTRICTOR  
FEATURE IN A VIBRATION-REDUCTION MOUNT WITH INTERLOCK FEATURE

Inventor(s): Wirges et al.

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# Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/US04/025504

International filing date: 06 August 2004 (06.08.2004)

Document type: Certified copy of priority document

Document details: Country/Office: US  
Number: 60/492,918  
Filing date: 06 August 2003 (06.08.2003)

Date of receipt at the International Bureau: 22 September 2004 (22.09.2004)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland  
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse